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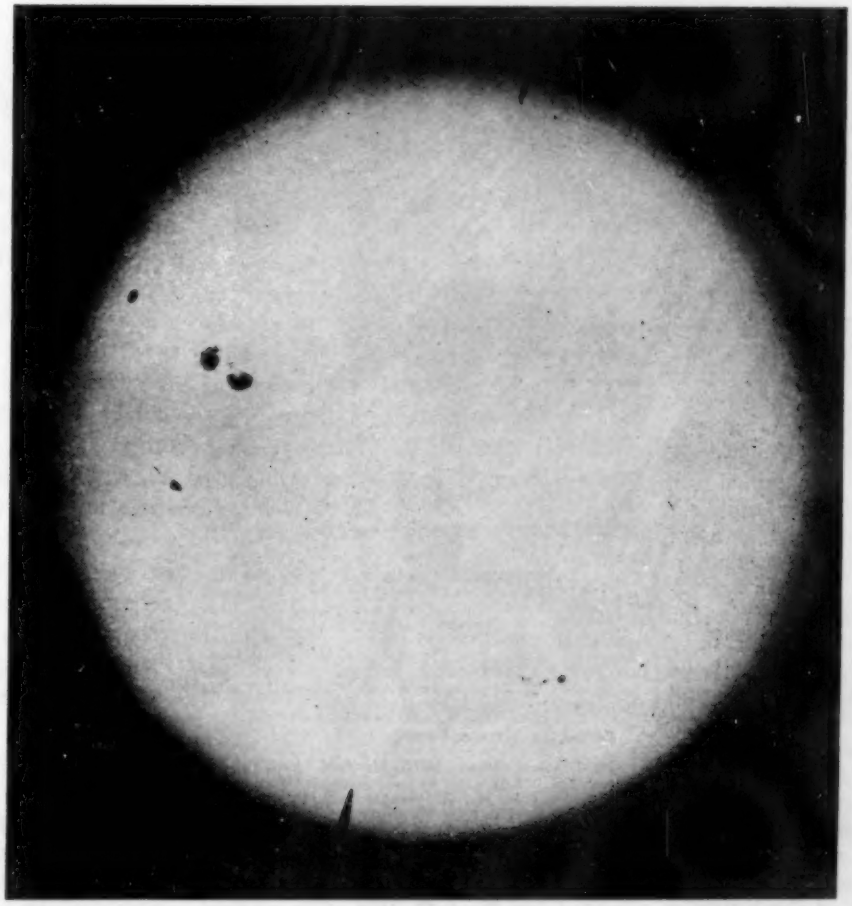
SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

A SCIENCE SERVICE PUBLICATION

$5 a year 15c a copy July 21, 1928



OUR SPOTTED SUN

Solar Tornadoes Caused Recent Northern Lights

(*See page* 28)

Vol. XIV *No. 380*

Punch Holes in This Space for Loose-Leaf Binder Cover

Sun Spot Caused Magnetic Storm

Astronomy

A severe magnetic storm that disrupted telegraph communication recently, and displays of the northern lights as far south as Texas, where they are rarely seen, were two of the consequences of the recent display of sun spots. The cover this week shows a photograph of the sun made with the 60-foot tower telescope at the Mt. Wilson Observatory in California on July 9. The notches at the top and bottom were photographed at the same time as the sun to determine directions. The top is the north, the east side of the sun is to the left and the west to the right. A pair of mirrors at the top of the high tower reflect the sun's light into a lens, so that an image of the sun is formed at the base, where it can be studied or photographed. Or, if desired, its light may be sent down into a pit below containing a powerful spectroscope. Another such instrument at Mt. Wilson mounted in a 150-foot tower is used regularly to observe the sun.

A sun spot is supposed to be a vast whirl—something like a tornado—in the sun's outer surface. As it is relatively cooler than the surrounding part of the sun, it appears dark, but actually is intensely bright. Once in a period of about eleven years sun spots become particularly numerous, as now, for it is just about at the sun spot maximum. This cannot certainly be identified, however, until after the time has passed, and the numbers are definitely on the downward trend.

But much is yet to be known of their nature. In a recent book ("Elements of Astronomy," McGraw-Hill), Prof. Edward A. Fath says:

"It is evident that a sun-spot is a complicated phenomenon and much remains to be done before all details are clear. Thus it is evident that the influence of the spot must extend below the levels shown. Nothing definite is known concerning the cause of spot, or why they vary in number, nor why spot zones appear in middle latitudes and gradually approach the equator. These problems as well as others are still unsolved."

Though the relation of sun-spots to terrestrial conditions is also uncertain, it is believed that they are connected with aurora borealis and magnetic storms.

Science News-Letter, July 21, 1928

Medical Progress

With this issue the SCIENCE NEWS-LETTER welcomes to the ranks of its readers the subscribers to *Medical Progress*, a journal for laymen, the publication of the American Association for Medical Progress.

To these lay upholders of scientific medicine, the SCIENCE NEWS-LETTER will bring, week by week, reports and comments upon the latest researches in all fields of science, including medicine. The present readers of the SCIENCE NEWS-LETTER will profit from the special articles obtained for these columns by Dr. Benjamin C. Gruenberg and his associates upon the staff of the American Association for Medical Progress.

There is no better propaganda for science than the romantic facts of research and discovery. It is the hope of Science Service as the institution for the popularization of science that those who read its reports, either in the SCIENCE NEWS-LETTER or in its newspaper articles, that now reach a fifth of America's newspaper readers, will unconsciously and effectively join the ranks of enthusiasts.

To the new readers of the SCIENCE NEWS-LETTER an invitation is issued to join in the work of Science Service. This magazine is filling a unique place upon America's extensive reading table. It is America's only popular science weekly. Scientists and school children alike tell us they enjoy it. To spread the increasing circle of friends of the SCIENCE NEWS-LETTER we will send sample copies to any whom you wish to designate.

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SCIENCE NEWS-LETTER, The Weekly Summary of Current Science. Published by Science Service, Inc., the Institution for the Popularization of Science organized under the auspices of the National Academy of Sciences, the National Research Council and the American Association for the Advancement of Science, in which *Medical Progress* is merged.

Edited by Watson Davis.

Publication Office, 1918 Harford Ave., Baltimore, Md. Editorial and Executive Office, 21st and B Sts., N. W., Washington, D. C. Address all communications to Washington, D. C. Cable address: Scienserve, Washington.

Entered as second class matter October 1, 1926, at the postoffice at Baltimore, Md., under the act of March 3, 1879. Established in mimeographed form March 13, 1922. Title registered as trade-mark, U. S. Patent Office.

Subscription rate—$5.00 a year postpaid. 15 cents a copy. Ten or more copies to same address, 5 cents a copy. Special reduced subscription rates are available to members of the American Association for the Advancement of Science.

Advertising rates furnished on application.

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INTERPRETING week by week, the latest developments in the various fields of science, this magazine attempts also to present its articles in the most pleasing and readable topography and the most convenient arrangement.

The *clippability*, *indexing*, and *automatic dating* of each article are unique features.

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Each article is automatically *dated* by its last line.

All of the resources of Science Service, with its staff of scientific writers and correspondents in centers of research throughout the world, are utilized in the editing of this magazine.

A Rooster With A Spur on His Head!

Physiology

By Frank Thone

What would you do if you saw a white rooster with a spur growing on his head instead of his heel?

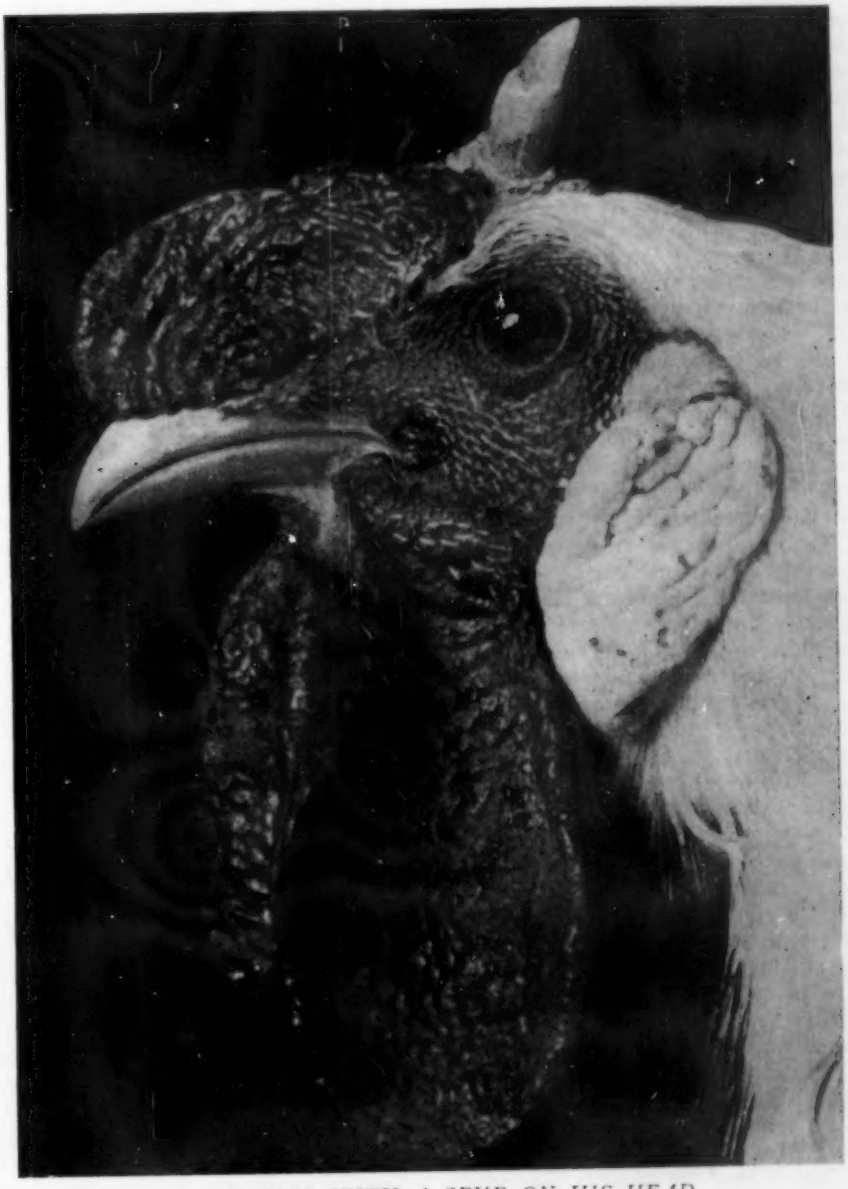
And if he were joined by another strutting fowl with a big red comb growing on his heel instead of his head?

And then another one with a spur sticking straight up on the middle of his back?

The reaction to be expected from the average citizen, on seeing such a spectacle, might well be left to the imagination of jokesmiths who nowadays win a goodly share of their daily bread with "gags" on the difficulties experienced in enforcing certain well-known legislation. Nevertheless, those roosters are real. They exist in the actual flesh, and the soberest total abstainer that ever came out of Kansas can see them without prejudice to his good reputation, if he will go to the laboratories of the zoology department of the University of Pittsburgh.

These fowl, to be sure, didn't get that way naturally. They didn't voluntarily turn themselves into unicorns, nor trim their legs with their natural head-ornaments as the result of a gallinaceous whim. In the too common political phrase, it's all a graft. Or rather, it's all a series of grafts. Grafts in the very literal sense, for these spurs and combs and patches of tissue generally have been removed from their original points of growth by surgical operation and transplanted to alien localities where they have taken hold and are growing just as though they had been there from the beginning. They are animal grafts, just as the tops of our apple and plum and pear trees are plant grafts.

The three weird brethren in feathers are only samples of the queer birds to be seen in this zoological laboratory. There are other roosters there with spurs and combs sticking out of their anatomy at all sorts of unexpected places. A comb on a drumstick or a spur on a wing or a wishbone are commonplaces in this fantastic menagerie. Less conspicuous but not less interesting from the scientific point of view are other transplantations of skin and feathers only, from one part of a fowl to another place on its own body, or to the body of one of its penmates.



A ROOSTER WITH A SPUR ON HIS HEAD

For this strange flock of chickens has not had its external anatomy thus juggled merely to make the observer doubt his senses or his sobriety. It is a part of a well-conceived and carefully carried out plan of scientific research. Its aim is to get conclusive data on one of the most-debated questions in physiology, and upon its final outcome—for the experiments are still in progress—will depend the fate of certain procedures practiced on man himself, especially in the fields of skin grafting and plastic surgery.

Certainly the experiments were never started with the deliberate purpose of creating a sensation. The man whose skill and patience have made them a success, A. W. Kozelka, is retiring to the point of outright painful shyness; it is only when one gets him started on his beloved subject of tissue transplantation that his reserve melts and he warms into enthusiasm. And Prof. H. H. Collins, under whom Mr. Kozelka is working as a graduate student, has been quietly doing fundamental work on other phases of the same problem for many years without ever attempting to maneuver himself into the limelight.

(Turn to next page)

A Rooster with a Spur on His Head—*Continued*

When Mr. Kozelka began transplanting spurs and combs and bits of integument around on his chickens he was really asking them questions. He was asking them whether they could grow these things in places where they were not used to growing. He was also asking them whether they could trade spurs, combs or bits of hide, and make their new acquisitions as much a part of their natural selves as were the old pieces with which they parted while they were stretched out unconscious under the ether. For there has been much dispute among scientific men whether such transplants of animal tissue could be made successfully, either from place to place on a given animal or from one animal to another. And Mr. Kozelka wanted a real answer, not just some more half-answers that would only lead to more disputes.

The reason for his success in growing spurs and combs in seemingly unnatural places is that fundamentally these things are parts of the skin itself, just as in man the hair on his head and the nails on his fingers and toes and the pink mucous lining of his nose and mouth are all parts of the skin-tissue system. From this point of view, a rooster's spur might be regarded as an overgrown callous spot, and his comb as a kind of ornamental wart. So a transplanted spur is after all only a transplanted bit of skin; somewhat specialized skin, to be sure, but still skin. Thus the whole nine-days' wonder of the Pittsburgh laboratories resolves itself into a research on skin grafting.

But why bother with skin grafting? Hasn't that been done for many years? Isn't it a closed question?

That is just the point. Skin grafting is not a closed question. Many surgeons refuse to perform such operations, at least when they involve the transfer of skin from one person to another, claiming that such transplants never "take".

Here obviously is an important and practical issue. If skin transplants do not "take", then the heroic volunteers who offer themselves to the surgeon's knife for the sake of a friend are suffering needlessly. But if they do, and the surgeon hesitates to perform the operation, then the patient suffers needlessly.

Hence Mr. Kozelka's surgical questions to his fowls. The first one was, "Can you grow on any part of your body a piece of skin or skin-tissue taken from any other part?" To this he received a decided "Yes." A bit of skin lifted from the top of a young chick's head and planted on its leg took hold easily, and in time developed into a typical comb, in spite of its being where the spur ought to be. A bit of skin bearing the undeveloped tissue-bud of a spur planted on top of the head likewise took hold and as the fowl grew up developed into a full-grown spur, in spite of its being where the comb ought to be. In a very large proportion of cases, these "autografts" of skin from place to place on the same animal's body have been entirely successful and have lived on indefinitely.

When it came to the second question, however, the answer was by no means so emphatic. This question was, "Can you take on a bit of the skin of another fowl of the same breed, and make it a part of your own skin system?" Such alien transplants are known as "homoiografts". Sixty-nine cases of homoiografts took hold and grew into place, but of them all only 18 survived until the fowl carrying them had grown to maturity. On all the rest the homoiograft tissue has gradually dwindled, being absorbed by the surrounding tissue into which it had been transplanted, until finally it disappeared altogether, leaving only a scar. It is harder, also, to get one of these homoiografts to take hold in the first place; autografts seem to find themselves more at home on flesh exactly identical with that which they knew in the first days of their life. There seems, indeed, to be a positive antagonism between the homoiograft and the tissues into which it is planted. The latter frequently swell up, develop an abnormally full net work of blood vessels and in general get inflamed, which is the normally antagonistic reaction of the body to an alien invader.

In his experiments, Mr. Kozelka partly got around this tissue-antagonism difficulty by making most of his homoiografts between fowls closely related to each other. Physiological antagonism of any sort is due to chemical differences between blood substances of the animal concerned and the materials invading them. Skin from one's own brother might reasonably be expected to be more nearly related chemically to one's body than skin from a total outsider, and thus more likely to be accepted by the tissues without the antagonism-reaction.

The traditional conservatism of females was observed in these experiments in a rather striking way. Combs of hens would grow all right if planted somewhere else on their original owners' bodies, but they did not grow to the full size they would have achieved had they remained on top of the head. Similarly, the much-reduced nubbins of spurs which most hens have could not be transplanted successfully beyond the limits of the scaly part of the leg. They would grow there all right, but planted on the drumstick or on any other part of the body they remained juvenile. Skin bearing feathers, however, could be shifted around pretty much at will, and grew normally wherever it succeeded in taking hold at all.

The carefree and cheerful male, however, was not to be discouraged by finding his spurs in the wrong place. He went ahead and grew them anyhow, whether they were on his heels or his head. Spurs are the mark of full-blooded, lusty roosterhood, and must be brought to full growth no matter where the fortunes of war or of surgery happen to put them. It is not recorded, however, whether any of these "unicorn" roosters have learned to use their head-spurs for horns, and to fight after the manner of billy-goats.

A source of never-ending wonder to strangers in the laboratory is the apparent cheerful indifference with which these chickens accept their strange condition, and above all the ease with which they recover from the operations to which they are subjected. The ether leaves them rather groggy for a time, but so far as the cut and bandaged parts of their anatomy are concerned, they do not seem even to be conscious that anything has happened to them.

Apparently the answer is just that. They really are not conscious that anything has happened to them. Chickens seemingly haven't got enough brains to have any imagination, and it is imagination that knocks a man out when he is hurt or thinks he is going to be. A chicken neither remembers past discomfort nor anticipates future troubles; so it goes most unconcernedly through experiences that would make us humans worry ourselves into hospital beds. An operated chick is usually on its feet within a few minutes after it recovers from the anesthetic, and the (*Turn to page* 37)

Drugs and Animal Experimentation

Medicine

Prepared for publication in *Medical Progress*, a journal for laymen, which is now consolidated with the SCIENCE NEWS-LETTER. Other articles edited by the American Association for Medical Progress will appear in these pages from time to time.

BY ARTHUR H. HIRSCHFELDER, M. D.

The oldest drugs in use have come down from prehistoric times, their usefulness having been established through experience. The ancients knew the purgative value of the waters from mineral springs; the shrines of Hippocrates (460-370 BC) and other great Greek physicians, who mixed religion with their medicine, were located near mineral springs. The ancient inhabitants of India found out that the seeds of their opium poppy would produce sleep and soothe pain; and so opium was carried to Egypt, Greece and China along all the routes of Old World commerce. The Arabians knew that certain balsams and aromatic herbs contained something that helped the healing of wounds, and they brought these primitive antiseptics to Western Europe; though only in the fiction of Walter Scott were they potent enough to heal infected wounds, as Rebecca cured the wounds of Ivanhoe.

The alchemists experimented with mercury in the hope of turning it into gold. By a fortunate chance they used it successfully in a salve to cure the lice and itch which infested the knights of the Middle Ages. By a still more fortunate accident, this same mercury salve was found to cure the venereal plague fo syphilis, which, whether or not it was introduced into Europe by the sailors of Columbus, was first found to overrun Europe just after the discovery of America.

A drug is a substance which, administered to a patient, will tend to cure disease, allay pain or relieve other symptoms. Each drug therefore must have the properties that can produce definite changes in the workings of the body. The great German pharmacologist Paul Ehrlich, laid down the rule that to be safe for treating human beings, a drug must produce the effect desired with less than one-tenth of the amount that might be dangerous. This rule, ever since the discoveries of Ehrlich, has guided pharmacologists in making drugs better and safer.

In order then to be able to use a drug, we must first find out which of all the substances that compose it are the active ones. This is done by chemical separation or analysis. Then each ingredient must be tested. We must learn just how it acts on each organ of the body, that we may know under what conditions it can be helpful or might be dangerous. We must ascertain how much of it will poison or kill an animal, to avoid administering such a dose to human patients. We must learn whether the dose that will produce the desired effect is too near the dose that would injure or kill the patient; very many substances whose effects indicate that they might be useful, exert those effects only when given in amounts too close to the danger line.

It is clear then that, first of all, we must understand the exact workings of the living body, just as the garage worker understands his automobile and recognizes the meaning of the various knocks and noises of its operation. A man who knew merely what the machinery of an automobile looked like (knew the anatomy) would not be useful unless he knew what it was like when the engine was running (understood its physiology), or in case of trouble, could diagnose what was wrong with it from its symptoms, and from them tell how each part was injured (knew the pathology).

The Basis of Pharmacology

But in addition to being a machine, the human body can repair its tissues and organs by healing, by growing parts anew, or by sealing wounds with scar tissue; and the organs of the human body are often capable of enlarging so as to do the increased work that a chronic disease may require. Hence no physician can learn about the living, running human machine from a dead body. He can learn about the living heart, muscle, nerves, digestive organs, and so on, only by studying them in living human beings or by watching their simplest reactions in living animals. The organs of a human being operate in ways very like the organs of animals; the organs of a diseased patient act much as do those of animals in which similar conditions are experimentally produced. To make the organs of a diseased human being operate more normally, the physician uses drugs which can modify the actions of these diseased organs favorably. It is upon the science of experimental pharmacology that modern treatment rests.

A great heart stimulant, digitalis, the active substance in the common foxglove, was discovered accidentally by an English doctor, William Withering, (1741-1799) about the time of the American Revolution. He found that an old woman in the country made a tea out of a mixture of several herbs, one of which was the foxglove, and that with this decoction she had cured several people who had dropsy and whom he had failed to cure. But Withering thought that his digitalis cured his patients of their dropsy by stimulating the kidneys; this we have since found to be incorrect. Almost a hundred years later, the action of this drug on animals was studied by the English physician, Sir Lauder Brunton, (1844-1916). He found that instead of stimulating the kidneys, it made the hearts of frogs and of dogs beat slower and stronger, and so in modern times it has been used as a heart stimulant. Thousands of men and women live useful lives for ten and twenty years after they would have sunk into their graves but for Lauder Brunton's accurate experiments on dogs, with the drug which Withering had given to the world without knowing just how it acted.

Within the last twenty years this drug has been studied again from a different angle, and still greater benefits to humanity have resulted. A German physiologist, Theodor Wilhelm Engelmann, (1843-1906) had found that by touching the heart of a frog it beat again at once, interrupting the regular rate of its contraction. He touched different parts of these frogs' hearts and made them contract irregularly in many different ways, and then showed that dogs' hearts responded in the same way. Ten years passed, and an English country doctor, James MacKenzie, (1853-) puzzled by the irregular beats of his patients' hearts, began to study their (*Turn to next page*)

Animal Experimentation— *Continued*

pulses. He found that some pulses beat in two-step, some foxtrotted in four-step, some beat at a slow march of half-time, and some were out of step with every step and rhythm. He looked up Engelmann's studies on the frogs' hearts and dogs' hearts and found that the hearts of his patients had acted just as those of Engelmann's animals had done; so he reasoned that the disturbances in his patients' hearts must be quite like those that Engelmann had produced. This gave to physicians an entirely new understanding of hearts that beat irregularly. It was found that some which had been thought serious, were really normal, or represented insignificant disturbances which needed no treatment. This was especially true in many children, whose hearts were a little irregular but who were otherwise perfectly normal.

Relief From Dropsy

Later others studied the exposed hearts of dogs and learned what was wrong when the heart beat entirely out of step with any tune or rhythm. This is the commonest and most dangerous ailment of all (auricular fibrillation). MacKenzie then showed how with digitalis the heart could be made to beat slowly and strongly even though out of step. Next Prof. Cary Eggleston of New York (1884-) together with Prof. Robert Anthony Hatcher (1893-) showed how doses of digitalis large enough to make a doctor of the old days tremble with terror, were quite safe for animals and human beings. With these larger doses, patients panting for breath and swollen with dropsy on one day, were breathing quietly and were free from dropsy on the next, with pulses large, strong and quiet, though still irregular.

In the last few years, Wenckebach, a Dutch professor at Groningen, and Max von Frey in Germany, have shown that such irregular hearts, beating out of step with every rhythm, can be made to snap back and so restore health and comfort, without danger to the mind or body of the patient.

The Adrenal

Almost a hundred years ago an English physician, Thomas Addison (1793-1860), found that a certain disease, in which the patient grows weak and pale and slowly dies, is due to a disturbance or deficiency in the two little pads of yellow tissue which rest above the kidneys and are called the suprarenal or adrenal glands. Little else was known on the subject until in 1895 the English physiologists, Sir Edward Albert S. Schaefer (1853-) and Sir Thomas Oliver, showed that an extract of these glands injected into dogs would stimulate the heart and blood vessels. It remained for an American pharmacologist, Professor John J. Abel 1857-) of John Hopkins, in 1898, to produce the active principles of this gland in pure powdered form, which he called epinephrine. It acted on the heart and blood vessels of dogs in the same way as did the extract of the gland. A little later, the Japanese chemist, Jokichi Takamine, working in America, produced it in a little purer crystalline form, which he called adrenalin, and the Viennese chemist, Pauli, found out just how it can be made in the laboratory.

Epinephrine or adrenalin is the strongest known stimulant for the heart. Injected directly, it sometimes can even revive a heart that has stopped beating. Painted on a bleeding surface, it makes the blood vessels shrink and stop bleeding. A drop put into the nose can shrink up the mucous membrance and relieve a cold or sinus trouble. Injected under the skin, it widens out the bronchi and gives relief for asthma and hay fever. But none of these uses were discovered by trial on human beings alone. It was only after the exact effects had been determined and safe doses had been worked out on living animals that the real uses of adrenalin in medicine could have been found.

Insulin

The sweetbreads of the calf are a delicacy long enjoyed by epicures; but no one suspected that they had any connection with diabetes, the disease in which there is too much sugar in the blood, until in 1889, Oscar Minkowski (1858-) and Joseph von Mering cut the sweetbreads (pancreas) from a dog, and found that the dog acquired diabetes like that in human beings. So they tried to treat diabetes with powdered pancreas just as Schiff had done with the thyroid, but when fed by mouth it was useless, and injected under the skin it was dangerous.

Twenty-five years with thousands of experiments went by, and then a young pathologist, Admont Clark at Johns Hopkins, showed that if salt solution were passed through the blood vessels of a dog's pancreas, this blood would help the heart of a diabetic dog to burn up more sugar. John R. Murlin (1874-) in Rochester, New York, carried these experiments further and found that fluid passed through the blood vessels of a dog's pancreas and injected into a diabetic dog tended to keep him free from sugar. He was making similar extracts for use in diabetic men when the world was electrified by a young Canadian doctor, E. G. Banting, who had made a very active extract from beef sweetbreads which he proved could be injected under the skin and would cause even severely ill diabetics to burn up their excess sugar, and would revive even those who were in the last stages of unconsciousness.

Since then, hundreds of thousands of diabetics lead comfortable and active lives, depending with confidence on daily injections of this substance, *insulin*, for their strength and comfort. They are not cured of the disease, but are able to prevent it from asserting itself by regular injections of the remedy. Just what this substance is, we do not know. Professor Abel, the great discoverer of epinephrine, has shown that it contains a compound of sulphur, and many sulphur compounds are active in the quiet oxidations that go on in chemical laboratories. He has obtained it in fine white crystals, and that is the first great step toward learning its exact composition, and then making it at will. What will be the next step we do not know. Much more work will have been done and many new substances tried out on animals, that the diabetic may know the complete comfort and safety that is sure to come with the remedies of the future.

Testing Drugs

Not only is experimentation on animals necessary for the discovery of new drugs, but the law requires that every sample of the old and well known drugs be tested on animals, to determine whether it is strong enough for its purpose, and safe enough to use on human beings. Every serum against diphtheria or lockjaw, every vaccine, every sample of insulin for diabetes, every sample of digitalis or aconite for heart disease must be thus tested.

Experiments upon animals have taught us the exact causes of most of the diseases that affect our health. It is only by such experiments that the remedies for (*Turn to next page*)

Legislative Season Ends

Medicine

A summary prepared by the American Association for Medical Progress.

Despite agitation by opponents of things as they are in matters medical, the state legislative season has closed with the legal status of medicine practically unchanged. Laws in certain states have been strengthened by restatement and by the addition of important clauses. None of the legislative blows made at the cause of medical progress achieved its purpose.

The most noteworthy legislation comes from Virginia, which state has incorporated its whole general body of medical law into one comprehensive act, covering registration of physicians, verification of licenses for practice, defining unprofessional conduct as a basis for revoking or refusing to grant licenses, providing the same high basic educational requirements for the practice of medicine, homeopathy, osteopathy or chiropractic, limiting the administering of drugs by unlicensed persons, and defining the status and rights of the chiropodist. Finally it defines the term "practicing medicine" as applied, and provides punishments in fine and imprisonment for violation of the law. The law also definitely prohibits the sharing of fees between a physician and a surgeon to whom the physician refers a patient.

In New York no less than sixty-seven bills dealing with various phases of medical practice were introduced in the Legislature. Only a few were ever reported out of committee. Those which did pass were largely in the nature of minor amendments and amplifications of existing regulations. The anti-vivisection bill in behalf of dogs, and the anti-vaccination bill both died in committee.

The Kentucky State Medical Board has again emerged unscathed from a particularly virulent legislative attack on its whole scope and organization. The "Ripper Bill", as it is known in the Blue Grass State, has appeared perennially for a long time. Adherents of the Board claim that this attack is purely political, and in general the Board of Health has had the backing of the medical profession and of the progressive element of the state.

In Washington, the Parker Bill, granting in general additional research facilities for the Public Health Service, passed but was vetoed.

Bills empowering the Smithsonian Institution to make recommendations for suitable recognition of research and other workers who risk life or health in the public service, and for granting pensions to the survivors of the yellow fever experiments, were reported out of the House committees before Congress adjourned. They will come up next winter.

Science News-Letter, July 21, 1928

Animal Experimentation—*Continued*

these diseases have been found and made safe and effective; and it is by experiments upon animals that the diseases for which specific remedies have not been found, will finally be conquered in the future.

Science News-Letter, July 21, 1928

Automobiles in New York City wreck $18,000 worth of lamp posts each year, and 60 per cent. of these accidents are due to intoxicated drivers.

Septic Sore Throat

Medicine

Septic sore throat, the disease that is responsible for the present large loss of life in the small Massachusetts village of Lee, is caused by a micro-organism very similar to the one causing scarlet fever. Both are members of the streptococcus family. They can only be differentiated by a complicated test which must be carried out on a human subject, officials of the U. S. Hygienic Laboratory said recently.

The present epidemic is by no means the first of the kind. Septic sore throat has occurred as an epidemic in this country and England since 1875. Generally the milk supply was the agent that spread the disease. In 1911 over a thousand cases with 38 deaths were reported in Boston, while Chicago, in the same year, had 10,000 cases within a few weeks. Baltimore had 3,000 cases with 30 deaths in 1912.

The milk becomes infected through the humans who handle it, and not through the cow, as in the case of tuberculosis. Cows may become infected with the organism, but it does not cause disease in them and such infection of the animal, as well as the contamination of the milk, is due to contact with infected humans, for this organism is not native to cows.

Science News-Letter, July 21, 1928

Magnetism and Static

Physics

When your radio crackles, squeals, moans, or stubbornly remains silent despite your coaxing, does the earth's magnetism have anything to do with such antics? That is what scientists of the Coast and Geodetic Survey have been trying to find out. F. P. Ulrich, magnetic observer of the Survey, stationed at Sitka, Alaska, summarizes the results of five years' observations by saying in a recent report: "In general, the condition of the earth's magnetic field is no index of the quality of radio reception." Thus the fact seems to be established that the earth's baffling magnetic forces are not to blame when your radio goes on a temperamental rampage.

Mr. Ulrich observed that the aurora borealis, or northern light, which is a manifestation of the earth's magnetism, occurs in greatest brilliancy on magnetically disturbed days. The aurora causes difficulties in cable transmission, he says, but "observations seem to indicate that good radio reception is very much more apt to occur than poor reception during a bright or faint aurora." That absolves the aurora, magnetism's magnificent advertisement, from suspicion of being the monkeywrench in radio's machinery.

In an effort to unravel the greatest of all scientific mysteries—the earth's magnetism—scientists have been making methodical, monotonous, deadly dull routine observations for years. They record the daily and hourly variations in the earths' magnetic forces at widely scattered observatories from Samoa to Honolulu and Alaska. An effort is also made to connect these records with other phenomena such as earthquakes, sun spots, and the aurora, and with radio reception and telegraphic and cable disturbances. It is hoped in this way to ferret out Nature's most profound secret—the secret of those magnetic forces which, up to now, have defied scientific analysis.

Science News-Letter, July 21, 1928

Among the world's needed inventions listed by British patentees are a collapsible umbrella to fit into a pocket; an unpuncturable pneumatic tire; rubberized fabric for heels, toes and soles of hosiery, and a clear name plate for streets that can be easily read by night or day.

Housewives, Dietitians, Teachers, Students and Just-Folks-Who-Eat—

They're All Buying *NUTRITION*

The new, simple book on how to buy food, what to buy and what to eat, by WALTER H. EDDY of Teachers' College, Columbia, and Associate Director, Bureau of Foods and Sanitation, Good Housekeeping Magazine.

NUTRITION was published in June and at once stepped into the "best seller" group in its class. Why?

It contains the facts.

It tells them simply and entertainingly.

It is practical and useful—correct diet goes far toward guaranteeing health.

Read the excerpt in the adjoining column.

Then use the coupon below.

From Eddy's *Nutrition*

"Food selection has engaged the attention of man ever since the first pangs of hunger created the demand for food. Man's earliest food experiments were probably matters of selection or rejection on the basis of taste and satisfactory consequences. We have progressed a long way since these early experiments, but it is only during the last half century or perhaps in a lesser period that food selection has assumed the aspect of a science. In fact, we might say with little fear of contradiction that mankind has learned more about food selection and the part played by food in the control of health during the past twenty-five years than in any other period of the world's history.

"There are certain studies which may be left to inclination and aptitude. There are other studies whose pursuit may be safely omitted from our personal attention because when we need their benefits we can hire experts to supply them. But all of us eat. All of us either are kept well or become ill in proportion as our food selection is sound or faulty. All of us eat several times a day and on that account alone, few can afford to hire experts to select food for them. Combine with these obvious facts the realization that likes and dislikes are no longer criteria for sound food selection and it becomes worth while for all of us to devote a little time to the learning of how to buy food, what to buy, and what to eat."

The Williams & Wilkins Co.
Mt. Royal and Guilford Aves.,
Baltimore, Md.

Please send me ..... cop ..... of Eddy's NUTRITION, for which remittance is enclosed to cover at $2.50 per copy.

Name .....

Address .....

.....

SNL—7-21

Cosmic Rays

Physics

L. H. R., in the *New York Times*:

Any item on the atom has a charm;
I can hear about electrons all the day,
While for light and lively reading,
Give me something not exceeding
Half a column on the Cosmic Ray.

Since I follow Dr. Millikan a bit,
I will help him state the subject very clear.
I will make elucidation
Of this funny emanation
That has lately been arriving here.

It's a flicker from a superheated star.
It can penetrate a dungeon or a lake,
It can pass right through a mountain
Like a sunbeam through a fountain
Or a cleaver through a T-bone steak.

Yet it isn't any light we've ever known;
It is just a sort of tingle in the air
When electrons free are mated
And an atom is created
In the incandescent star up there.

It assures us that the Universe is hale,
And we needn't any longer have a doubt
That the element production
Will go on without obstruction
When our Planet Earth is all worn out.

Such the theory that Millikan and I,
Backed by Einstein, have decided to adopt.
I would cheerfully expand it,
But by now you understand it,
So the matter may as well be dropped.

Science News-Letter, July 21, 1928

Tularemia, sometimes known as rabbit fever, was named for Tulare county in California, where the disease was studied in 1912.

Most bats live entirely on insects; though one species eats fruit, and the famous vampire of the tropics likes the blood of animals.

Texas has 11,771 unprotected grade crossings, the largest number in any state, while Rhode Island has only 58, the smallest number.

Daylight Television by Bell System

Physics

Engineers of Bell Telephone Laboratories who over a year ago gave a remarkable demonstration of television recently disclosed some of the further progress which they have made during their continued researches by demonstrating a new transmitting device which is capable of putting upon the television circuit outdoor scenes. On the roof of the Laboratories actors boxed and danced, swung baseball bats and tennis rackets to appear in brightly illuminated pictures in one of the laboratories on the eighth floor. The present apparatus differs radically from that of the first demonstration when the scene to be transmitted was illuminated by a powerful artificial light and only the actor's head and shoulders appeared in transmission. With the improved apparatus the scene was illuminated by ordinary sunlight and covered the area occupied by two men engaged in a friendly boxing match.

In the first form of apparatus demonstrated in April of last year, the scene was illuminated by a rapidly oscillating beam from a powerful arc light and that limited the scene to be transmitted to a very small area. The new development frees television from one of its most serious limitations.

The scene or event to be transmitted is reduced to the form of an image by a large lens, this image being scanned by a rapidly rotating disc similar to that previously employed but much larger. The lens serves somewhat the same purpose in the television apparatus as the large lens of an astronomical telescope, and, like the latter, it should be large to gather as much light as possible.

THE LATEST IN TELEVISION. The apparatus used in recent daylight television tests when full length figures of men playing tennis, or boxing, on the roof of the Bell Telephone Laboratories in New York, were seen by wire in a room several floors below. In actual use the transmitter, at the right, is covered so that it is lightproof. There can be seen the large scanning disc, which breaks up the image of the lens into small parts, like the dots of this half-tone picture when viewed with a magnifying glass.

The experiments show that moving persons and objects can be successfully scanned, although at a considerable distance from the lens and therefore in such a position that the focus of the lens does not require changing from moment to moment. Light passing through the lens and scanning disc is caused to actuate a light responsive device of extreme sensitiveness and generate an electric current which after amplification may be transmitted either by wire or radio.

The developments in television which were demonstrated were perfected by Dr. Frank Gray of the Laboratories working in collaboration with Dr. Herbert E. Ives. They illustrate the continued interest and progress of the telephone engineers in the problems of television, but the engineers themselves refused to prophesy as to future developments or applications. They pointed out that the improvement was in the television transmitter and that its use required no fundamental change in the two types of receiving equipment for use by either single individuals or by larger audiences which were developed and demonstrated a year ago.

Science News-Letter, July 21, 1928

Zinc and Boron Needed by Plants

Plant Physiology

The common metal zinc, together with boron, the chemical basis of borax, are needed by plants if they are to live and grow in full health, according to Miss A. L. Sommer and Prof. C. B. Lipman of the University of California. The amounts needed are exceedingly minute; one part of each in two million parts of the solution surrounding the roots will suffice, but without these microscopic quantities plants drag out a dwindling, sickly existence or even perish altogether. These minerals, together with several others needed in equally minute amounts, are likened by the experimenters to the almost undetectably small amounts of the vitamins needed by man and the lower animals.

To test the response of plants to such low concentrations of the two elements, most elaborate precautions had to be taken, the two researchers report. Even the dust of the air might carry enough zinc or boron to feed a plant otherwise kept completely deprived of it by specially refined chemicals dissolved in double-distilled water; so a smaller greenhouse was built inside a large one, and all the air used in ventilating it carefully filtered. Since ordinary glass contains a little zinc, the jars used in part of the experiments were made of pyrex glass.

A number of different kinds of plants were grown in the culture jars. One set was given a properly balanced ration of mineral nutrients, but not zinc. Another set was similarly deprived of boron. Other plants were supplied with a full ration plus both boron and zinc, in the very low concentration of one part of each to two million parts of water. The plants supplied with both boron and zinc made a healthy and flourishing growth, while those that lacked either of the two elements showed only a fraction of normal growth or even failed to advance beyond the seedling stage.

Science News-Letter, July 21, 1928

Dialog on Olympus

Education

WALTER LIPPMANN, in *American Inquisitors: A Commentary on Dayton and Chicago* (Macmillan):

Socrates: I don't understand you. You say there were many people in your day who believed that God had revealed the truth about the universe. You then tell me that officially your citizens had to believe that human reason and not divine revelation was the source of truth, and yet you say your state had no official beliefs. It seems to me it had a very definite belief, a belief which contradicts utterly the belief of my friend, St. Augustine for example. Let us be frank. Did you not overthrow a state religion based on revelation and establish in its place the religion of rationalism?

Bryan: It's getting very warm in here. All this talk makes me very uncomfortable. I don't know what it is leading to.

Socrates: I don't either. If I did, I should not be asking questions. What is your answer, Mr. Jefferson?

Jefferson: I'll begin by pointing out to you that there was no coercion of opinion. We had no inquisition.

Socrates: I understand. But you established public schools and a university?

Jefferson: Yes.

Socrates: And taxed the people to support them?

Jeflerson: Yes.

Socrates: What was taught in these schools?

Jefferson: The best knowledge of the time.

Socrates: The knowledge revealed by God?

Jefferson: No, the best knowledge acquired by the free use of the human reason.

Socrates: And did your taxpayers believe that the best knowledge could be acquired by the human reason?

Jefferson: Some believed it. Some preferred revelation.

Socrates: And which prevailed?

Jefferson: Those who believed in the human reason.

Socrates: Were they the majority of the citizens?

Jefferson: They must have been. The legislature accepted my plans.

Socrates: You believe, Mr. Jefferson, that the majority should rule?

Jefferson: Yes, providing it does not infringe the natural rights of man.

Socrates: And among the natural rights of man, if I am not mistaken, is, as you once wrote, the right not to be compelled to furnish contributions of money for the propagation of opinions which he disbelieves, and abhors. Mr. Bryan, I think, disbelieves and abhors the opinion that man evolved from a lower form of life.

Bryan: I do. It is a theory which undermines religion and morality.

Socrates: And you objected to being taxed for the teaching of such an opinion?

Bryan: I most certainly did.

Socrates: And you persuaded the representatives of a majority of the voters in one state to forbid this teaching in the schools they were compelled to support.

Bryan: It was an outrageous misuse of public funds.

Socrates: May I ask whether you meant that nobody should be taxed to support the teaching of an opinion which he disbelieved, or whether you meant that the majority shall decide what opinions shall be taught.

Bryan: I argued that if a majority of the voters in Tennessee believed that Genesis was the true account of creation, they had every right, since they pay for the schools, not to have the minds of their children poisoned.

Socrates: But the minority in Tennessee, the modernists, the agnostics, and the unbelievers, also have to pay taxes. Do they not?

Bryan: The majority must decide.

Socrates: Did you say you believe in the separation of church and state?

Bryan: I did. It is a fundamental principle.

Socrates: Is the right of the majority to rule a fundamental principle?

Bryan: It is.

Socrates: Is freedom of thought a fundamental principle, Mr. Jefferson?

Jefferson: It is.

Socrates: Well, how would you gentlemen compose your fundamental principles, if a majority, exercising its fundamental right to rule, ordained that only Buddhism should be taught in the public schools?

Bryan: I'd move to a Christian country.

Jefferson: I'd exercise the sacred right of revolution. What would you do, Socrates?

Socrates: I'd re-examine my fundamental principles.

Science News-Letter, July 21, 1928

What Is Matter?

Physics

BERTRAND RUSSELL, in *The Saturday Review of Literature*, says: I think that if we were to search for one short phrase to characterize the difference between the newer physics and that of past times, I should choose the following: *The world is not composed of "things"*. To the metaphysician this is no new idea, but in the past the metaphysician could not point to the technique of science as being on his side, and he was therefore unable to combat the popular metaphysics which survived contentedly alongside of his speculations. Nowadays, physicists, the most hard-headed of mankind, the people associated more than any others with the intellectual and mechanical triumphs that distinguish our epoch, have embodied in their technique this insubstantiality which some of the metaphysicians have so long urged in vain. "We are such stuff as dreams are made on" was once a piece of poetic imagination; now it is among the presuppositions of physics.

Science News-Letter, July 21, 1928

Epidemic influenza appears about every 25 years.

In the half-second between raising the heel of the foot to step forward and planting it on the ground again, a man exercises 54 muscles.

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Freak Roosters—*Cont'd*

only outcry one hears from it arises at feeding time if its crushed grain is not promptly forthcoming. Mice and rats and guinea pigs and even dogs in the laboratories seem to have the same indifference to what has happened or yet may happen, and they are thereby able to recover in hours— or even minutes — from operations that would put the more imaginative human species into the convalescent ward for days or weeks. It is perhaps fortunate for them that this is so, for animals in nature, and even in domestication, are called upon very often to endure and recover from injuries compared with which the most radical laboratory experiments are mere fleabites. It is not fashionable any longer to speak as our grandfathers spoke, of "the marvellous provisions of Nature"; but this state of affairs certainly looks like something of the sort.

In the meantime, undisturbed by philosophical speculations over the indifference of his chicks to what happens to them, Mr. Kozelka carries on. His experiments still have a long course to run, but enough has been done already to give a good glimpse of daylight. Tissue transplants from place to place on the same animal are practicable, even relatively easy. Taken from one animal and put on another they are not so easy, though they can still be made in a fair proportion of tries, and at least a part of them will survive the attempts of the "native" tissues to absorb and displace them. These things are now being weighed and evaluated by physiologists and watched by surgeons; tomorrow may see the beginnings of their application to our own needs.

Science News-Letter, July 21, 1928

If one common housefly and all his descendants flourished, the family would number 1,096,181,249,320,720,000,000,000,000 by the end of the season.

Chinchilla rabbits, which are becoming popular as fur animals, must be bred for both fur and food if they are to be profitable, government experts warn.

Triplets occur in families about once in 6,000 births.

New Yellowstone Theory

Geology

A new history of the Grand Canyon of the Yellowstone will need to be written as a result of geological research by members of the Princeton Summer School of Geology and Natural Resources who have just completed an investigation of the canyon and the area bordering this great natural ditch.

When the first transcontinental expedition of Princeton geologists, traveling in the special geological Pullman "Princeton", as well as students, visited Yellowstone Park in 1926 they obtained the first hints that the origin and history of the canyon needed reexamination and possible revision. This year the area was restudied by the geologists under the leadership of Prof. R. M. Field, director of the expedition, and Prof. O. T. Jones of the University of Manchester, England, one of the foreign guests.

During the Tertiary period, the age of mammals, some tens of millions of years ago, the geologists concluded, a canyon of nearly the present dimensions was excavated. This great waterworn depression was later blocked by volcanic lavas near its lower end and filled to the brim with sediments. The present canyon from the upper falls of the Yellowstone to the lower end was largely reexcavated only a few millions of years ago. The digging of the new canyon by the river's water has taken place since the great Glacial epoch, when ice covered much of America.

"One of the most striking conclusions resulting from this discovery," Prof. Field declared today, "is the fact that the lower fall of the Yellowstone has occupied its present position since the later Tertiary period when the first excavation of the canyon was made."

Profs. Field and Jones will publish further details of their discoveries in the fall after the return of the expedition which is now enroute to the Pacific coast. The new information obtained suggests to these experts that the stratigraphy and petrography of this frequently visited region needs revision upon the maps and in the geological records.

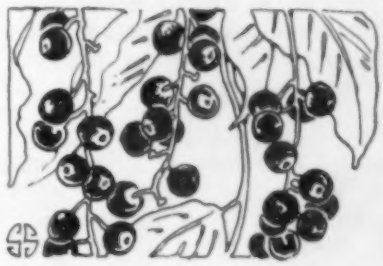
Science News-Letter, July 21, 1928

In a survey of state prisons in Kentucky it was found that almost one-third of the male prisoners had dependent children under 16 years old at the time they were sentenced.

Nature Ramblings

By Frank Thone

Natural History



Wild Cherries

Last spring the wild cherry trees helped to make the countryside glad with bloom; now their small dark red or black fruits are giving the summer an adornment proper to its more sultry beauty. Most species of wild cherry bear their fruits singly or in small clusters, as do the cultivated varieties, but the black cherry, which is perhaps the most widespread and abundant member of the genus, offers them on long strings or racemes. The trees are usually very prolific too, so that in late July and August there is almost as much of black on their twigs as there is of green. The fruits of the wild cherry, like most wild fruits, are not palatable to tastes trained on the milder products of cultivated orchards. They have too much "pucker" in them, due to their high tannin content, and their acidity is usually rather high as well. But a few of them, added judiciously to conserves or marmalade, will give a tang and spice that many persons like.

And whether or not supercilious man condescends to harvest these free-will offerings of nature, the birds at least do not despise them. A wild cherry tree is a banquet table for many feathered species. In return for the feast, the tree collects free transportation for its seeds. These latter, being hard and indigestible, pass uninjured through the digestive tracts of their devourers, and may be dropped hundreds of yards, or even several miles from the place of their origin. Thus it comes to pass that in the wild thickets that spring up in clearings or burned places in the woods, and in the similar growth that rises wherever there is a fence for the birds to perch on, there are always some wild cherry trees.

Science News-Letter, July 21, 1928

Early Travels in Ceylon

Geography

FRIAR ODORIC in *Contemporaries of Marco Polo* (Boni & Liveright):

I passed also by another island called Ceylon, which contains in compass above two thousand miles; wherein are an infinite number of serpents, and great store of lions, bears, and all kind of raving wild beasts, and especially elephants. In this country there is a huge mountain where, the inhabitants of that region report, Adam mourned for his son Abel the space of five hundred years. In the midst of this mountain there is a most beautiful plain, wherein is a little lake containing a great amount of water, which the inhabitants report to have come from the tears of Adam and Eve. However, I proved that to be false, because I saw the water flow into the lake.

This water is full of horse-leeches, and blood suckers, and of precious stones also; these precious stones the king takes not for his own use, but once or twice every year he permits certain poor people to dive under the water for the stones, and all that they can get he bestows upon them, to the end that they may pray for his soul. That they may, with less danger, dive under the water, they take lemons which they peel, anointing themselves thoroughly with the juice thereof, and so they dive naked under the water, the horse-leeches not being able to hurt them. From this lake the water runs into the sea, and at a low ebb the inhabitants dig rubies, diamonds, pearls, and other precious stones out of the shore. Wherefore, it is thought that the king of this island has greater abundance of precious stones than any other monarch in the whole earth.

In this island there are all kinds of beasts and fowls, and the people told me that these beasts would not invade nor hurt any stranger, but only the natural inhabitants. I saw in this island fowls as big as our country geese, having two heads [the rhinoceros hornbill, which has two bills] and other miraculous things, which I will not here write of.

Traveling on further toward the south I arrived at a certain island called Bodin, which in our language means unclean. In this island there live most wicked persons, who devour and eat raw flesh, committing all kinds of uncleanness and abominations. For the father eats his son, and the son his father, the husband his own wife, and the wife her husband, and this they do in the following manner. If any man's father be sick, the son straightway goes to the soothsayer, or prognosticating priest, requesting him to demand of his god whether his father shall recover of that infirmity or not. Then both of them go to an idol of gold or of silver, making their prayers to it in manner following: "Lord, thou art our god, and thee we do adore, beseeching thee to resolve us, whether such a man must die, or recover of such an infirmity or no." Then the devil answers out of the idol. If he says he shall live, then his son returns and ministers things necessary to him, till he has attained his former health. But if he says he shall die, then the priest goes to him, and putting a cloth to his mouth, strangles him therewith. This being done, he cuts his dead body into pieces, and all his friends and kinsfolk are invited to the eating thereof, with music and all kinds of mirth. But his bones are solemnly buried.

When I found fault with this custom, demanding a reason for it, one of them gave me this answer: "This we do, lest the worms should eat his flesh, for then his soul should suffer great torments." I could by no means remove from them this belief. Many other novelties and strange things there are in this country, which no man would credit, unless he saw them with his own eyes.

However, I—before almighty God—do here make record of nothing but of that only of which I am as sure as a man may be sure.

Science News-Letter, July 21, 1928

The Science of Parenthood

Psychology

JOHN B. WATSON, in *Psychological Care of Infant and Child* (Norton):

No one today knows enough to raise a child. The world would be considerably better off if we were to stop having children for twenty years (except those reared for experiment purposes) and were then to start again with enough facts to do the job with some degree of skill and accuracy. Parenthood, instead of being an instinctive art, is a science, the derelation to his own daily life seems decidely remote.

Will you believe the almost astounding truth that no well trained man or woman has ever watched the complete and daily development of a single child from its birth to its third year? Plants and animals we know about because we have studied them, but the human child until very recently has been a mystery. Radium has had more scientific study put upon it in the last fifteen years than has been given to the first three years of infancy since the beginning of time. How can we get the facts on how to rear children unless we make the studies necessary to obtain them . . . . . Most mothers perhaps feel quite naturally that all infant and childish activities, whether "good" or "bad," are due to the unfolding of the inborn equipment of the child; and that they as parents haven't much to do with the process of growth.

But in the last few years there has come a social Renaissance, a preparation for a change in mores, a scrutiny of age-old customs that bids fair to become much more of an epoch in history than the scientific Renaissance which began with Bacon in the 16th century. This awakening is beginning to show itself in mothers who ask themselves the question, "Am I not almost wholly responsible for the way my child grows up? Isn't it just possible that almost nothing is given in heredity and that practically the whole course of development of the child is due to the way I raise it?" When she first faces this thought, she shies away from it as being too horrible. She would rather load this burden upon heredity, upon the Divine shoulder, or upon any shoulder other than her own. Once she faces it, accepts it and begins to stagger under the load, she asks herself the question, "What shall I do? If I am responsible for what this tiny being is to become, where shall I find the light to guide my footsteps," When such thoughts drive is it any wonder that there has been recently an almost frantic interest in what the laboratories of the behaviorist psychologists have to say about infant culture.

Science News-Letter, July 21, 1928

FIRST GLANCES AT NEW BOOKS

FOREST FOLKLORE, MYTHOLOGY, AND ROMANCE—Alexander Porteous—*Macmillan* ($4.50). A book with a dual role. The author has an exhaustive knowledge of the role played by groves and forests in history and mythology, and his book makes a useful reference work for those interested in trees and men. At the same time, enthusiasm for his subject has enabled the author to present the old myths and references in entertaining style for general reading

Ethnology—Forestry
Science News-Letter, July 21, 1928

THE LAWS OF LIVING THINGS—E. J. Menge and R. A. Muttkowski—*Bruce Publishing Co.* ($1.72). This general biology text for high-school students shows evidence of great care by its authors for manner as well as matter. Not even the dullest student would be able to escape the terseness and emphasis of its text, and it would require a most determined blunderer to go wrong with the diagrammatic, boldly labeled illustrations. Since both authors are professors in Jesuit universities, the brief, closely reasoned sections on evolution will be of especial interest. Conservatively fair though these statements are, they will still, in all probability, not pass muster in many Southern and other rural communities. *Biology*
Science News-Letter, July 21, 1928

FOIBLES OF INSECTS AND MEN—By William Morton Wheeler—*Knopf.* Probably Dr. Wheeler was so pestered by friends and admirers for reprints of Teermitodoxa, or Biology and Society, and the Physiognomy of Insects that he had to publish his papers in book form in self defense. Readers will follow the daily life of ants, wasps and tree crickets with bated breath and avid interest, whether they know any entomology or not. Why can't all scientific treatises be filled with the breath of life?

Entomology
Science News-Letter, July 21, 1928

SANTANDER—E. Allison Peers—*Knopf* ($2.50). The reader is introduced to a little known but charming province of northern Spain by a British professor who has spent many summers there and is an enthusiastic guide. The famous Cave of Altamira, containing remarkable wall paintings of the Old Stone Age, is one of the places visited in this quaint region. *Geography*
Science News-Letter, July 21, 1928

CONTEMPORARIES OF MARCO POLO—Edited by Manuel Komroff—*Boni and Liveright* ($3.50). These four medieval Europeans who journeyed eastward to Mongol courts and Indian cities have not had the popular renown of Marco Polo, but they have tales to tell as extraordinary as his. The famous khans, whose names still conjure up visions of the bizarre and mysterious, figure vividly in the accounts, and the descriptions of Mongol life and customs translate the reader into a strange world. A welcome addition to the medieval travelers' journals is an introduction which unrolls enough of the historic panorama to render the old accounts clear.

Geography
Science News-Letter, July 21, 1928

GEOLOGY OF MONGOLIA—Charles P. Berkey and Frederick K. Morris—*American Museum of Natural History* ($10). This is the second volume of a series on "Natural History of Central Asia," based on the Asiatic expeditions of the American Museum. Cataloging the deserts, mountains, and river beds of the East into a geological system has always presented great difficulties, and a comprehensive volume of this sort is an important contribution. The journey of the Third Asiatic Expedition, made in 1922-23, is described from the geologists' point of view, followed by summary chapters which explain more generally the geologic evolution of Mongolia. In view of the search for ancient man in Asia, the geologists' testimony as to the character of the region will be of interest to students of anthropology. The third volume of the series will also deal with geology, reporting later studies of these members of the Asiatic Expeditions.

Geology
Science News-Letter, July 21, 1928

LIBERIA—OLD AND NEW—James L. Sibley and D. Westermann—*Doubleday, Doran.* Devotes attention to American agencies in Liberia with special reference to missionary and educational work.

Geography
Science News-Letter, July 21, 1928

STORY OF HAIR—Charles Nessler—*Boni and Liveright* ($2.50). All about hair, past, present and future by the inventor of the permanent wave.

Anatomy-Folklore
Science News-Letter, July 21, 1928

PRACTICAL TELEVISION—E. T. Larner—*Van Nostrand* ($3.75). A British publication, written by a member of the Engineering Department of the British Post Office, and with a very considerable British bias. Most of the space is devoted to the system of J. L. Baird, which has attracted much attention in England, but which, in quality of results, is far behind the results obtained in this country by Ives, Alexanderson and Jenkins. The latter two American workers are mentioned, but only in connection with their earlier forms of apparatus. Dr. Ives is not mentioned, while the method of the Bell Laboratories, which probably gives the best results of any system yet developed, is dismissed in a page and a half.

Physics
Science News-Letter, July 21, 1928

THE WAYS OF BEHAVOIRISM—John B. Watson—*Harper* ($2). This author's experiments with babies and his lively championing of an all-physical psychology long ago intrigued public curiosity. And now Dr. Watson has written his latest and last volume on behaviorism for the general reading public—for "cultured people regardless of their grounding in science". The book will appeal particularly to those practical readers who like to see how psychological principles fit into everyday life and conduct. And for readers whose ideas of behaviorism are hazy, here is a pleasant way of getting acquainted with the Watsonian doctrine.

Psychology
Science News-Letter, July 21, 1928

ENCYCLOPEDIA OF PSYCHOLOGY—Edited by Elmer S. Prather—*Psychology Foundation—Brussels.* A collection of essays and explanatory articles on the practical application of psychology, written for the average reader. The thirty-eight authors are mostly British, with some Americans, and a few other nationalities. The range of the volume is indicated by a chapter on the Intelligence Quotient by Sidney Balister, another on poise and power by the Russian dancer, Karsavina, one on the seven deadly sins by Rev. Thomas Cameron, and one on various phases of fear by Leo Robertson.

Psychology
Science News-Letter, July 21, 1928

The Evolutionist and Death

Evolution

VERNON KELLOG, in *Scribner's Magazine:*

In any discussion of death with its mystery, we ought to have constantly in mind the limitations of our special senses, even as strongly reinforced as they now are by instruments of great delicacy and precision. We must keep in mind the ignorance I have previously referred to regarding the fundamental character of matter and energy. If we try to sum up our present understanding of the ultimate make-up of the universe by declaring that all is but electricity in motion, as a great physicist has declared, we have not done much more than to affirm our profound ignorance of the ultimate facts of existence. We keep on discovering new forms of energy. The "cosmic rays" which Millikan is studying so intensively show us that interplanetary space is not the void we have for so long tried to conceive of its being. Atoms are out there, breaking down and releasing tremendous forces which come to us as a radiant energy that penetrates six feet of lead. What mighty phenomena we have still to become acquainted with! What secrets of the cosmos are still to be revealed to us!

The stored-up reserves of energy in various forms of inorganic matter are only beginning to be realized by us. What reserves are there in organic matter? What possibilities of transformations are there in living bodies? In what new mould may life be cast when that moment of change in the human body comes which we call the moment of death? These are questions now unanswerable, but some time we may have the answers. It is a bold man who would venture now to guess them. It is a reckless man who would declare, with the dogmatism which is no less characteristic of some scientific men than of some theologians, that death ends humanness, unless by humanness we mean only that special form of it with which we are now familiar. The human body and spirit as we now recognize them may constitute but a stage in the full flowering of humanness. Death may be but the change from one condition of humanness to another. The evolutionist is familiar with change, with profound and radical change. It is this change that is evolution. He is usually able to see the before-change condition and the after-change condition. But in the case of that change we call human death he can see only that before-change condition. What the after-change condition is he knows but in part. And that part unknown to him may be the part that means everything to him.

Science News-Letter, July 21, 1928

More than half the deaths from falls are among people over 55 years old; whereas more than half the deaths from burns are among children under 10.

Magyar peasants of Hungary sometimes eat bacon and bread four times a day.

The Fiji Islands export more than half a million bunches of bananas a year.

Some insects fly only once in their short lifetime, in connection with mating.

Inhabitants of Mars, if any, have a day that is about half an hour longer than ours.

Cattle were kept for their skins and meat during two or three thousand years before men learned to use beasts to plow or pull wagons.

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CLASSICS OF SCIENCE: Periodic Law of the Elements

Chemistry

The elements known to Mendeleeff are shown in his original table reproduced on this page. Wt. 45, 68, and 70 are his eka-boron, eka-aluminum and eka-silicon. He predicted the properties of these elements, and elements with the properties he predicted were discovered within 15 years. They are gallium, scandium and germanium. The other gap in his list, Wt. 180, is Hafnium, discovered in 1922.

THE PERIODIC LAW OF THE CHEMICAL ELEMENTS. By Professor Mendeleeff. (Faraday Lecture delivered before the Fellows of the Chemical Society in the Theatre of the Royal Institution, on Tuesday, June 4th, 1889.)

The high honour bestowed by the Chemical Society in inviting me to pay a tribute to the world-famed name of Faraday by delivering this lecture has induced me to take for its subject the Periodic Law of the Elements—this being a generalisation in chemistry which has of late attracted much attention. . . .

It was in March, 1869, that I ventired to lay before the then youthful Russian Chemical Society the ideas upon the same subject, which I had expressed in my just written "Principles of Chemistry."

Without entering into details, I will give the conclusions I then arrived at, in the very words I used:

"1. The elements, if arranged according to their atomic weights, exhibit an evident *periodicity* of properties.

"2. Elements which are similar as regards their chemical properties have atomic weights which are either of nearly the same value (*e. g.*, platinum, iridium, osmium) or which increase regularly (*e. g.*, potassium, rubidium, cæsium).

"3. The arrangement of the elements, or of groups of elements in the order of their atomic weights corresponds to their so-called *valencies* as well as, to some extent, to their distinctive chemical properties—as is apparent among other series in that of lithium, beryllium, barium, carbon, nitrogen, oxygen and iron.

"4. The elements which are the most widely diffused have *small* atomic weights.

"5. The *magnitude* of the atomic weight determines the character of the element just as the magnitude of the molecule determines the character of a compound body.

"6. We must expect the discovery of many yet *unknown* elements, for example, elements analogous to aluminum and silicon, whose atomic weight would be between 65 and 75.

Соотношеніе свойствъ съ атомнымъ вѣсомъ элементовъ.

Д. Менделѣева.

но въ ней, мнѣ кажется, уже ясно выражается примѣнимость выставляемаго мною начала ко всей совокупности элементовъ, пай которыхъ извѣстенъ съ достовѣрностію. На этотъ разъ я и желалъ преимущественно найдти общую систему элементовъ. Вотъ этотъ опытъ.

			Ti=50	Zr=90	?=180.
			V=51	Nb=94	Ta=182.
			Cr=52	Mo=96	W=186.
			Mn=55	Rh=104,4	Pt=197,4
			Fe=56	Ru=104,4	Ir=198.
			Ni=Co=59	Pl=106,6	Os=199.
H=1			Cu=63,4	Ag=108	Hg=200.
	Be=9,4	Mg=24	Zn=65,2	Cd=112	
	B=11	Al=27,4	?=68	Ur=116	Au=197?
	C=12	Si=28	?=70	Sn=118	
	N=14	P=31	As=75	Sb=122	Bi=210
	O=16	S=32	Se=79,4	Te=128?	
	F=19	Cl=35,5	Br=80	I=127	
Li=7	Na=23	K=39	Rb=85,4	Cs=133	Tl=204
		Ca=40	Sr=87,6	Ba=137	Pb=207
		?=45	Ce=92		
		?Er=56	La=94		
		?Yt=60	Di=95		
		?In=75,6	Th=118?		

FACSIMILE OF MENDELEEFF'S ORIGINAL TABLE. In the text above it, he explains that this is only one of many possible arrangements to show the periodic function. The arrangement more familiar to us is the work of Lothar Meyer.

"7. The atomic weight of an element may sometimes be amended by a knowledge of those of the contiguous elements. Thus, the atomic weight of tellurium must lie between 123 and 126, and cannot be 128.

"8. Certain characteristic properties of the elements can be foretold from their atomic weights.

"The aim of this communication will be fully attained if I succeed in drawing the attention of investigators to those relations which exist between the atomic weights of dissimilar elements, which, as far as I know, have hitherto been almost completely neglected. I believe that the solution of some of the most important problems of our science lies in researches of this kind."

Today, 20 years after the above conclusions were formulated, they may still be considered as expressing the essence of the now well-known periodic law. . . .

The Periodicity of the Elements

The periodic law, by insisting on the necessity for a revision of supposed facts, exposed itself at once to destruction in its very origin. Its first requirements, however, have been almost entirely satisfied during the last 20 years; the supposed facts have yielded to the law, thus proving that the law itself was a legitimate induction from the verified facts. But our inductions from data have often to do with such details of a science so rich in facts that only generalisations which cover a wide range of important phenomena can attract general attention. What were the regions touched on by the periodic law? This is what we shall now consider.

The most important point to notice is, that periodic functions, used for the purpose of expressing changes which are dependent on variations of time and space, *(Turn to next page)*

Periodic Law of the Elements—*Continued*

have been long known. They are familiar to the mind when we have to deal with motion in closed cycles, or with any kind of deviation from a stable position, such as occurs in pendulum-oscillations. A like periodic function became evident in the case of the elements, depending on the mass of the atom. The primary conception of the masses of bodies or of the masses of atoms belongs to a category which the present state of science forbids us to discuss, because as yet we have no means of dissecting or analysing the conception. All that was known of functions dependent on masses derived its origin from Galileo and Newton, and indicated that such functions either decrease or increase with the increase of mass, like the attraction of celestial bodies. The numerical expression of the phenomena was always found to be proportional to the mass, and in no case was an increase of mass followed by a recurrence of properties such as is disclosed by the periodic law of the elements. This constituted such a novelty in the study of the phenomena of nature that, although it did not lift the veil which conceals the true conception of mass, it nevertheless indicated that the explanation of that conception must be searched for in the masses of the atoms; the more so, as all masses are nothing but aggregations, or additions, of chemical atoms which would be best described as chemical individuals. . . . The periodic law has shown that our chemical individuals display a harmonic periodicity of properties, dependent on their masses. Now, natural science has long been accustomed to deal with periodicities observed in nature, to seize them with the vice of mathematical analysis, to submit them to the rasp of experiment. And these instruments of scientific thought would surely, long since, have mastered the problem connected with the chemical elements, were it not for a new feature which was brought to light by the periodic law and which gave a peculiar and original character to the periodic function.

If we mark on an axis of abscissæ a series of lengths proportional to angles, and trace ordinates which are proportional to sines or other trigonometrical functions, we get periodic curves of a harmonic character. So it might seem, at first sight, that with the increase of atomic weights the function of the properties of the elements should also vary in the same harmonious way. But in this case there is no such continuous change as in the curves just referred to, because the periods do not contain the infinite number of points constituting a curve, but a *finite* number only of such points. An example will better illustrate this view. The atomic weights—

Ag=108 Cd=112 In=113 Sn=118
Sb=120 Te=125 I=127

steadily increase, and their increase is accompanied by a modification of many properties which constitutes the essence of the periodic law. Thus, for example, the densities of the above elements decrease steadily, being respectively—

10·5 8·6 7·4 7·2 6·7 6·4 4·9

while their oxides contain an increasing quantity of oxygen:—

Ag_2O Cd_2O_2 In_2O_3 Sn_2O_4
Sb_2O_5 Te_2O_6 I_2O_7

But to connect by a curve the summits of the ordinates expressing any of these properties would involve the rejection of Dalton's law of multiple proportions. Not only are there no intermediate elements between silver, which gives AgCl, and cadmium, which gives $CdCl_2$, but, according to the very essence of the periodic law there can be none; in fact a uniform curve would be inapplicable in such a case, as it would lead us to expect elements possessed of special properties at any point of the curve. The periods of the elements have thus a character very different from those which are so simply represented by geometers. They correspond to points, to numbers, to sudden changes of the masses, and not to a continuous evolution . . . .

Law Enlarges Our Vision

In the remaining part of my communication I shall endeavour to show, and as briefly as possible, in how far the periodic law contributes to enlarge our range of vision. Before the promulgation of this law the chemical elements were mere fragmentary, incidental facts in Nature; there was no special reason to expect the discovery of new elements, and the new ones which were discovered from time to time appeared to be possessed of quite novel properties. The law of periodicity first enabled us to perceive undiscovered elements at a distance which formerly was inaccessible to chemical vision; and long ere they were discovered new elements appeared before our eyes possessed of a number of well-defined properties. We now know three cases of elements whose existence and properties were foreseen by the instrumentality of the periodic law. I need but mention the brilliant discovery of gallium, which proved to correspond to eka- aluminium of the periodic law, by Lecoq de Boisbaudran; of *scandium*, corresponding to eka-boron. by Nilson; and of *germanium*, which proved to correspond in all respects to eka-silicium, by Winckler. When, in 1871, I described to the Russian Chemical Society the properties, clearly defined by the periodic law, which such elements ought to possess, I never hoped that I should live to mention their discovery to the Chemical Society of Great Britain as a confirmation of the exactitude and the generality of the periodic law. Now, that I have had the happiness of doing so, I unhesitatingly say that although greatly enlarging our vision, even now the periodic law needs further improvements in order that it may become a trustworthy instrument in further discoveries.* . . .

*I foresee some more new elements, but not with the same certitude as before. I shall give one example, and yet I do not see it quite distinctly. In the series which contains Hg = 204, Pb = 206, and Bi = 208, we can guess the existence (at the place VI—11) of an element analogous to tellurium, which we can describe as dvi-tellurium. Dt having an atomic weight of 212, and the property of forming the oxide DtO_3. If this element really exists, it ought in the free state to be an easily fusible, crystalline, non-volatile metal of a grey colour, having a density of about 9.3, capable of giving a dioxide, DtO_2, equally endowed with feeble acid and basic properties. This dioxide must give on active oxidation an unstable higher oxide, OtO_3, which should resemble in its properties PbO_2 and Bi_2O_5. Dvi-tellurium hydride, if it be found to exist, will be a less stable compound than even H_2Te. The compounds of dvi-tellurium will be easily reduced, and it will form characteristic definite alloys with other metals .[Dvi-tellurium is now known as Polonium, a radio-active element discovered by Mme. Curie but never isolated.—Ed.]

Dmitri Ivanovich Mendeleeff was born February 7, (new style) 1834 in Tobolsk, Siberia, and died in St. Petersburg, Russia, February 2, 1907. He graduated in chemistry from the University at St. Petersburg at the age of 22. Five years later he began to teach, following that profession for 29 years. For the last 14 years of his life he was director of the Russian Bureau of Weights and Measures. Mendeleef's famous book, "The Principles of Chemistry," in which his idea of the periodic law of the chemical elements was set forth, was written in 1868, and the following year the account of the law was read before the Russian Chemical Society and published in their Journal.